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Cranberry Lake Biological Station Research Symposium, Session D

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Cranberry Lake Biological Station Research Symposium

Session D

2016



State University of New York
College of Environmental Science and Forestry

About EFB 202: Ecological Monitoring and Biodiversity Assessment

Ecological Monitoring and Biodiversity Assessment (EFB202) is the one of the keystone courses in the Environmental and Forest Biology curriculum. Students enrolled in this immersive course live at the Cranberry Lake Biological Station for three weeks. During the first two weeks of the course, students study a wide variety of taxonomic groups of organisms, and are introduced to a broad range of field, laboratory and analytical methods. Students then complete a group research project during the third and final week of the course. The research projects require proficiency in field sampling methods, basic experimental design and statistical analysis, and the ability to cooperatively solve problems.

The course culminates in a research symposium during which groups present their findings to their peers and a panel of judges.

Proceedings

Mighty Moss: The water-holding capacity, heat retention, and debris content of local moss genera in relation to its use as a traditional diaper material

Jodie Schoelkopf, Emma Livingston, Mia Eddy, Megan Ferreira

FIRST PLACE, SHIELDS RESEARCH AWARD

In the Adirondack region, mosses were one of many plants gathered and utilized by indigenous peoples. However, there is a limited amount of literature available that connects traditional moss usage with Western scientific methodology. *Sphagnum* moss was a popular resource among communities and was utilized for food preservation, cradles, insulation, furniture stuffing, and infant diapers (Harris, 2008). An effective moss diaper would be insulating, absorbent, and easy to prepare. This study attempted to verify indigenous knowledge by assessing heat retention, water holding capacity, and debris contained in four local moss genera: *Sphagnum* (peat moss), *Polytrichum* (haircap moss), *Dicranum* (carpet moss) and *Leucobryum* (pincushion moss). Processed *Gossypium* (cotton) was used as a control for heat retention and water-holding capacity experiments. These attributes were assessed to determine which moss was most likely used as an effective diaper material by native peoples in the region.

It was hypothesized that 1) *Sphagnum* would contain the least amount of debris relative to other mosses, 2) *Sphagnum* would have the slowest rate of heat loss relative to other mosses, and 3) *Sphagnum* would have the highest water holding capacity relative to other mosses. To quantify debris (g), each moss was agitated in water to release entrapped particles, which were then filtered, dried, and weighed. *Leucobryum* and *Sphagnum* contained the least debris. Water holding capacity (mL) was found by comparing the wet and dry weights (g) of each moss. *Sphagnum* had the highest water holding capacity, on par with cotton. Heat retention ($^{\circ}\text{C}/\text{min}$) was determined by soaking each genus in boiling water within a mesh bag, then removing to track temperature change over 60 minutes. There was no significant difference found between the heat retention of all genera. Our study verifies the use of *Sphagnum* by traditional cultures in its cleanliness and absorbent properties, and suggests it has the greatest potential as a traditional diaper material.



Plankton: I don't know, I didn't think we'd get this far
Hope Mahon, Aaron Goodell, Andrew Franceschini, Gwen Stark

SECOND PLACE, SHIELDS RESEARCH AWARD

At the Cranberry Lake Biological Station, motorboats are used daily in order to allow students to observe the natural environment around them by conducting research, making observations and exploring. Zooplankton are an essential part of the Cranberry lake food chain, and high amounts of boat traffic may negatively affect their abundance in the water. Due to the varying degrees of gas levels in the lake, it is hypothesized that zooplankton from the marina will have lower percent mortality than the zooplankton from the swimming dock in the presence of gasoline ($\mu\text{L-1}$). Zooplankton samples were collected from the swimming dock and the marina. Water samples were then collected from Sucker Brook, the swimming dock, and the marina and used to compare the percent mortality between the zooplankton from the marina versus the dock. The experimental groups were exposed to $100 \mu\text{L-1}$ gasoline, and both control and experimental groups were allowed to sit for 20 minutes. At the end of the twenty minute treatments, the number of alive and dead zooplankton were counted; twelve replications of this were completed. Statistical analysis will include ANOVA and paired t-tests. It is predicted that mortality rates of the marina plankton will be significantly less than dock plankton in all treatments.



**The Response of American Toads (*Anaxyrus americanus*)
to The Urine of Distressed Conspecifics**
Neyra Benoit, Ben Czapranski, Dwight Hospedales, Justin LaCorte

THIRD PLACE, SHIELDS RESEARCH AWARD

The American toad (*Anaxyrus americanus*) utilizes alarm pheromones to communicate most prominently in the larval stages of life (Chivers et al 1999). This is also a developing subject of study on adult *A. americanus* and other anurans (Woodley 2010). This method of communication between adult *A. americanus*, in regards to danger, was the objective of our study. We collected *A. americanus* and coaxed them into urinating in a jar with toilet paper and then put them in the experimental tank (one side had toilet paper with toad urine, and the other side had toilet paper with tap water). A different toad was then measured, sexed, and placed in a container with a hole on top and allowed two minutes to acclimate in the tank. The container was then lifted, and the toad's behavior and distance traveled was recorded during a two-minute period. After running a two proportion t-test, the results showed that *A. americanus* did not prefer water over the urine of a distressed conspecific. A Chi-square test was performed which showed that there was not a significant difference in the distance traveled away from the urine between large and small *A. americanus*. Another Chi-square test was done and showed that there was no difference in the distance traveled away from the urine between male and female *A. americanus*. The results of our study do not allow us to draw any significant conclusions in regards to the presence of alarm pheromones in the urine of adult *A. americanus*.



**An examination of the effects of substrate color on skin coloration
of the American Toad (*Anaxyrus americanus*)**

Deyanira Gaston, Kaili Revelle, Courtney Thomas, Mikayla Warren

The evolution of physical adaptations that allow organisms to blend in with their surroundings in order to avoid predation is key to the success of the species. One physical adaptation that allows for avoidance of predation is cryptic coloration, which is defined as the coloring or marking of an animal that conceals the organism in its natural habitat. The color value, in regards to shade, of the American Toad and its relationship to substrate color value is a topic that has not been studied in depth. We hypothesized that as forest substrate color value increases, meaning color becomes lighter, toad color value would also increase, as assumed by the theory of cryptic coloration. To explore this relationship, we quantified toad and substrate color using the Munsell Soil Color Chart. Timed meanders of half-hour intervals were conducted around the Cranberry Lake Biological Station, during which American toads were observed and body size was recorded. Color values for the toads and the substrate in which they were found were obtained using the Munsell Soil Color Chart. Data were analyzed using a linear regression to assess the significance of substrate color value on toad color value. This test showed a statistically significant positive correlation between these two factors ($p=0.001$, $r^2=0.2496$). From these results it can be inferred that American toads frequent in areas with substrate of similar color shade to their body in order to avoid predation.

Emma and the Barbels

Becky L. Stromfeld, Emma Gutierrez, Mike Howell, Jim Ferraiuolo

In the native Brown Bullhead Catfish (*Ameiurus nebulosus*), nerves, in unison with the release of specific hormones, will stimulate the dispersal of pigment cells turning the fish from their well-known murky black to an almost translucent white. This unique chromatic behavior has remained one of uncertainty over the years, as the intricate physiology of *Ameiurus nebulosus* may lead to a multi-situational response in color loss. The intention of this project is to look at which specific factors lead to this dramatic change within the Brown Bullhead in order to piece together its evolutionary purpose and benefit. Catfish were caught from Whoosh Pond using minnow traps and then exposed to one of four factors for 30 minutes. Color intensity was taken initially using a melanin color gradient, and again for every 10 minute interval. Environmental conditions studied included a change in pH, simulated predator stress, environmental color, and a control similar to their natural habitat. It was concluded that the environmental color affected the catfish the most, with the predation stress as also being a factor in the pigment loss. Changing the pH had no effect on the color. It was also found that color changed exponentially. Evolutionarily speaking, this means that the color depletion may be a camouflage tactic for the catfish with regards to the environment, and the release of the adrenaline hormone could also be connected with the hormone for melanin dispersal.

**Abundance of Black Spot parasite (*Neascus brevicaudatus*)
on Various Fish Species in Cranberry Lake**
Kory Whittum, Chris Bednarz, Ian Watosky

Pumpkin Seed and Yellow Perch are common hosts for Black Spot parasites. Both species are common game fish targeted for their meat but the Black Spot parasite can be a common deterrent for many anglers since it enters into the meat. Fish are more susceptible to hosting this parasite because they spawn in warm water conditions that promote the development and reproduction of the parasite. We hypothesized that Pumpkin Seeds would have a greater mean abundance of parasites. The warm water that Pumpkin Seeds spawn in makes them most susceptible to the success of the Black Spot parasite due to these warmer water spawning conditions. Fish were caught using 4 trap nets in Cranberry Lake which were checked every 24 hours for 4 days. The number of parasites and the length (cm) of each fish was recorded. Scales were removed in order to age the fish. This was done to see if there was a correlation between age of fish and number of parasites found. We will be using an ANOVA test to compare the differences between species and two regression models for comparing Age vs. number of parasites and length vs number of parasites. It is expected that pumpkin seeds will have a higher mean abundance of parasites and that there will be a positive correlation between age and number of parasites and length vs. number of parasites.

**Yellow Perch Smack Down: Comparison of Fish Abundance, Biomass, and Species Richness
Across Floating and Emergent Vegetation in Chair Rock Flow**

Sarah Fioramonti, Brianne Innusa, Jaime McClain, Eliza Phillips, and Brittany Washburn

During our aquatics classes we noticed that fish tended to prefer certain habitats, which led us to do further research on the topic of fish and the vegetation types they prefer. While doing this research we found that not many studies have been done on fish abundance, biomass, and species richness in different vegetation types. This led us to the question of: Is there a difference in fish abundance (number of individuals per species per vegetation), biomass (mass of each species per vegetated area), and species richness (number of species per vegetation type), between floating vegetation and emergent vegetation across Chair Rock Flow of Cranberry Lake? To answer our question we set out fish trap nets and minnow traps for four days across floating vegetated areas, emergent vegetated areas, and un-vegetated areas as a control, all within Chair Rock Flow. At each site we measured pH, temperature, and dissolved oxygen, and kept the depth within a range of 0.5 to 1.5 meters across all sites for consistency. We analyzed our data in Minitab using ANOVA's paired with Tukey tests. There was no statistical difference in the abundance, biomass, and species richness between our sites. We then did a Sorenson's test which showed that the two different vegetated types were only 27 percent similar. This test shows that the communities are different; however they are not

statistically different. For this reason we have failed to reject our null hypotheses. Fish populations tend to be sparse throughout the habitat which could have caused the high variation among the experimental units of each vegetation type. Therefore, more research would need to be done to further confirm or reject this trend.

Los Hongos Malos

Max Chabra, Justin Vargas, George Rose, David Voytovich

Woody polypores are saprobic fungi that decompose living and deceased trees. Beaver activity increases the amount of deadfall in and around beaver habitat, thus increasing the potential for woody polypore inoculation. We hypothesized that the greatest percentage of trees inoculated by woody polypore fungi will be ten meters from the beaver pond's edge. In order to test this hypothesis, four transects were surveyed at three separate beaver ponds. Each transect measured 50 meters in total, separated into five plots at ten-meter sections (10m, 20m, etc). Point-centered quarter surveys were taken at each plot. One tree in every quarter of each plot was surveyed for the presence of polypore inoculation; One-Way ANOVA tests and Tukey's pairwise comparisons tested for a significant difference between the mean percentages of inoculated trees at each plot measured from the beaver pond's edge. The results failed to reject the null hypothesis that there is no significant difference between the mean percentages of trees inoculated. However, a multiple linear regression tested for a correlation between amount of deadfall and woody polypore inoculation in each plot yielding significant results. Although our original hypothesis could not be accepted, the aforementioned correlation may display the effect of beaver activity (logging) on the proliferation of polypore fungi throughout a forest, indicative of possible changes in forest ecosystem dynamics in areas of logging by humans. Future studies investigating similar cohabitation should ensure various controls, such as elevation of surrounding landscapes, forest types/tree stands and present beaver pond activity.

Assessment of the growth of *Brasenia schreberi* (Water-Shield) in the South Bay of Cranberry Lake

Matthew Amoia, Sean Cromwell, Parker Everhart, Megan Jarvis, Caleb Kime

Brasenia schreberi (Water-Shield) is an aquatic plant that is common in shallow lakes and ponds and is widely distributed throughout the world. The plant has ecological importance as a primary producer and as a habitat for organisms in aquatic ecosystems. It was hypothesized that there would be a difference between organic content, light penetration ($\mu\text{mol m}^{-2} \text{s}^{-1}$), and water depth (m) in areas with and without *B. schreberi*. Six testing bays were randomly selected for study in the South Bay of Cranberry Lake. Three bays lacked growth of *B. schreberi* and three areas had growth. Experimental set-up was initiated by measuring a site 15 meters

from shore, then placing three rings one meter apart. In each ring, measurements were recorded. After sediment samples were collected, the samples were dehydrated at 100 °C, and then burned at 200 °C to remove organic matter. All data between the two areas were compared with a Student's T-test with $\alpha=0.05$. Results showed significant difference between soil depth ($p=0.000$) and light penetration ($p=0.000$) in areas with and without *B. schreberi*. There was no significant difference in organic soil content ($p=0.096$), but there was an observable difference in textures between the two areas. *B. schreberi* was found to prefer growing conditions with shallow depth and higher light penetration; however, analysis of organic matter was inconclusive due to variance and small sample sizes. Further studies can focus on density of *B. schreberi* related to light penetration, depth, and organic content to find preferred growing conditions.

Polypody Pals: Rock Polypody Densities Compared Between Moss and Leaf Litter

Robin Vanderworken, Elizabeth Lindemann, Sophie Miller, Mary Randacciu

The Northeast is dotted with glacial erratics left when the glaciers of the last Ice Age melted. Rock polypody fern (*Polypodium virginianum*) grows only on these boulders and fills an important role in the ecosystem by eroding the rock into soil (Baer 2009). Because of its soil producing capabilities, it is important to know whether rock polypody grows more densely on top of moss or leaf litter. It is our hypothesis that rock polypody will grow more densely on leaf litter than on moss. Rock polypody clumps were located and counted within 20 cm² grids and the type of substrate beneath it was recorded. For each boulder that rock polypody was found on, the soil depth, lux (light per square meter), and total area that a rock polypody could inhabit was recorded. Our results showed that rock polypody grows in higher densities on leaf litter than on moss ($p<0.0001$). With the limited amount that this species of fern has been studied, it is important to understand this primary eroder of boulders and where its higher densities are affecting the remaining glaciers.

The 49ers: Effect of Moisture and Stand type on *Coptis trifolia* Distribution within the Cranberry Lake Biological Station Region

Joshua Hitt, Jeanne Wu, Ashton Yost

Goldthread (*Coptis trifolia*), a rare plant species, is highly valued for its antibiotic, anti-tumor, and antiviral properties, which are now beginning to be over exploited. It is hypothesized that *C. trifolia* would be more abundant in spruce stands than in deciduous stands. It is also hypothesized that Goldthread will grow more abundantly in moist soils and that the deeper the leaf litter, the less abundant Goldthread will be. To test these hypotheses, Goldthread counts should be taken at regular intervals along a transect (random stratified sampling) and soil samples should be acquired for moisture content along with leaf litter samples. A linear

regression was run on both soil moisture and leaf litter depth, with both the moisture test and the leaf litter test showing a slightly negative correlation. A Chi-squared test should be used to compare the overall abundance of *C. trifolia* between spruce and deciduous stands, which results in no statistical difference at a confidence interval of 95%. In order to efficiently plan a conservation strategy for the preservation of this species, accurate habitat data must be collected, and analyzed to allow for a successful conservation plan.

Comparison of Endoparasite Abundance in *Ursus americanus* and *Odocoileus virginianus* at Cranberry Lake Biological Station

Dan Bebka, Marina Lupu, Greg Golando, Seaira Goetz

American black bears (*Ursus americanus*) and white-tailed deer (*Odocoileus virginianus*) are carriers of parasitic nematodes that are transmissible to humans and can cause diseases such as trichinosis. In this study at C.L.B.S. the relative abundance of *Trichinella* sp., *Trichuris* sp., and *Strongylida* worms was examined in fecal samples of the two mammals. We hypothesized that the relative abundance of nematodes and their oocytes will be greater in the feces of bears than in the feces of deer because of the abundance of parasites in soil where bears forage for arthropods. Forty-two samples (21 bear, 21 deer) were collected using twenty minute timed meanderings in various locations around Cranberry Lake. The scat samples were analyzed using fecal smears and fecal float procedures. Parasites were counted per slide. The samples were rinsed in a mesh sieve and the remaining undigested material was examined under a dissection microscope for the presence of arthropods. The t-test we performed concluded that there is no significant difference in the abundance of parasites between bear and deer scat. Another t-test concluded that there is no significant difference in the abundance of parasites between bear scat with and without arthropods present.

Succession InsucceSSION

Luria Lee, Ian Laih, Chad Halson

In the Adirondacks, fire disturbances are important in regulating ecological stand succession. We looked at the impact of fire disturbance on plant communities and hypothesized that there will be a higher plant species richness in old-growth sites than in disturbed sites, due to the later stage of canopy stratification that old-growth is in. Plant communities of three old-growth sites and three fire disturbed sites were compared. Point-center quarter and a Bitterlich prism was used to measure DBH, density, and confirm that the sites are old-growth or secondary. Timed meander and line-intercept method was used to measure plant species richness. Our results showed that total average basal area and tree density is higher in disturbed forests than old-growth, confirming that our sites are correctly identified as labeled. We found that major plant species differences between the sites were balsam fir, black cherry, blackberry,

bunchberry, eastern hemlock, grass, hay-scented fern, hobblebush, honeysuckle, lichen, princess pine clubmoss, red raspberry, sarsaparilla, serviceberry, and sugar maple. The weighted Sorensen's similarity index is 62.87%, indicating that species richness is statistically similar. Therefore we fail to reject our null hypothesis.

Frequency and Density of *Monotropa Uniflora* in Primary and Secondary Growth Forests at Cranberry Lake

Jessica Grant, Danielle Manna, Jet'aime Lewis

Monotropa uniflora (Indian Pipe) is a rare herbaceous layer plant of the Adirondacks that does not photosynthesize, but instead captures its nutrients by parasitizing the fungal ectomycorrhizae surrounding tree roots. There are several factors that can affect the success of *M. uniflora*'s ability to tap into these systems including forest succession and micro-topography. In our research, we hypothesized that there would be a higher density and frequency of Indian pipe in post-burn secondary forests compared to primary growth forests because of the potential for shallower root depth in saplings that *M. uniflora* would have access to in regenerating forests. The data was collected at three sites from primary and secondary forest types, respectively, at Wanakena, Arnold Point, and the Cranberry Lake Biological Station using eight 40-meter corridor transects. A two sample t-test was used for mean site density and an ANOVA and Tukey's comparison were performed to compare frequency of where *M. uniflora* was found and the micro-topography of each site. Our results yielded no significant difference in mean density across the primary and secondary growth forest types. Within and between these two forest types, we also found no significant difference in Indian pipe presence within hummocks, in hollows, nor on flat terrain. While our original observations suggested that *M. uniflora* preferred forest types with more variation in micro-topography (i.e secondary growth), there lacks a true relationship to support this hypothesis. There was a large presence of both hobblebush and a variety of ferns in both forest types which may have outcompeted saplings and inhibited the environment for *M. uniflora* to grow. Other factors to investigate in the unique relationship that characterizes this organism's survival could include a correlation between specific tree species or the influence of soil moisture.

Snake Pool Party: Response of common garter snakes (*Thamnophis sirtalis*) to a gasoline-contaminated environment

E. Beiter, M. Cipullo, C. Richardson, A. Sholk, M. Xiao

The garter snake is abundant in New York and often found near bodies of water. *T. sirtalis* has an enhanced chemoreceptor organ that allows for a higher sensitivity to pollutants. This experiment tests the species' response when introduced into a polluted substrate similar to those experienced in motor boat high-traffic areas. It was hypothesized that the snakes would

show a preference for non-contaminated soil when placed in a 1% motor boat gasoline-polluted substrate. Two minute trials were completed for each snake in both control and contaminated pools, with a record being taken every fifteen seconds in order to track the distance the individuals traveled from the initial test area. Paired t-tests allowed for comparison between control and experimental data at decidedly important data collection points, and a regression test was conducted to provide insight on any possible link between the length of snake and activity in response to the contamination.

Aggression Responses of Two Territorial Vireos to a Competitor's Song

Olivia Kadow, Anna Lee, Alexandria Soldo, Aberdeen White

Territorial songbirds have adapted to aggressively defend regions with beneficial resources. Two species of songbird within the Cranberry lake region that exhibit territorial behavior include the Red-eyed Vireo (*Vireo olivaceus*) and the Blue-headed Vireo (*Vireo solitarius*). We hypothesize that the Red-eyed Vireo will react more aggressively than the Blue-headed to the song of the Philadelphia Vireo (*Vireo Philadelphicus*), a potential competing species, possibly explaining why the Red-eyed Vireo is so successful in this region. Established coordinates of observed Red-eyed and Blue-headed Vireo territories were collected in order to avoid sampling the same individual twice, as they have defined boundaries. Our sample sizes vary between the two species due to Blue-headed vireos being less common. For Red-eyed vireos, $n=20$, and for Blue-headed $n=11$. A control song of a Hermit thrush, a local non-competitive species was played for two one minute intervals with a thirty second break between each, and the reaction of each individual was recorded on a scale of 0-6. The song of the Philadelphia vireo was then played at the same interval pattern, and reactions were rated according to our devised scale. Our results appear to be statistically significant in supporting our proposed alternative hypothesis. From the data we have collected, we can conclude that Red-eyed vireos display signs of territorial aggression at much higher levels than Blue-headed vireos to a third party competing species, the Philadelphia vireo.

Sparrow Wranglers

Leanne Sampson, Kiley Voss, Miranda Palmisano, John Short, Micaela Snyder

The white-throated sparrow (*Zonotrichia albicollis*) is an abundant species in the Adirondacks that exhibits territorial behavior in response to the vocalizations of competing males. The frequency as well as the variation of songs and chirping calls used by white-throated sparrow males determines the intensity of their aggressive responses. Recordings of both red-eyed vireo and white-throated sparrow songs were played to ensure the responses were not universal to all species; only to other white-throated sparrow males. White-throated sparrows demonstrated both low and high aggression with simulated territorial intrusions of the same species. Many of the subjects responded to the song by approaching the source and behaving

in an agitated manner. The levels of aggressiveness were quantified on a scale of 0-3, with 0 holding no response and 3 being the most aggressive. Two separate paired t-tests were used to compare the chirps received when the white-throated sparrow and red-eyed vireo songs were played, and the second compared the songs received from the two variables. A Mann Whitney U-test was used to compare the response of the male sparrow to the two variables. It was concluded that the white-throated sparrow is more likely to respond to the songs of other white-throated sparrows and not the red-eyed vireo. The results yield potential for future studies with the white-throated sparrow including differences in behavior of the two morphs; tan and white median crown, neighboring males, and the effects of polyandry.